(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 450 838 A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 91302630.8

(51) Int. Cl.[5]: H01R 4/64

(22) Date of filing: 26.03.91

(30) Priority: 31.03.90 GB 9007305

(43) Date of publication of application:
09.10.91 Bulletin 91/41

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

(71) Applicant: MANWEB PLC
Sealand Road
Chester CH1 4LR (GB)

(72) Inventor: Harrison, Barry James
2 Mellor Close
Runcorn, Cheshire, WA7 6PQ (GB)

(74) Representative: W.P. Thompson & Co.
Coopers Building, Church Street
Liverpool L1 3AB (GB)

(54) Bonding device for lead sheathed cables.

(57) A bonding device for connecting earthing bonds to lead sheathed cables, comprising a metal plate (40) adapted to be fitted to at least one earth bonding lead, the metal plate carrying on its one side surface a charge of solder disposed within a channel or recess defined by the metal plate. The charge of solder can be contained in discrete recesses (18) or within a length of copper braid (42) disposed within the channel defined by the metal plate. In the latter case, the channel can be defined by turning under the longitudinal side edges (40a) of the metal plate whereby to embrace the longitudinal side edges of the braid (42).

EP 0 450 838 A1

AM2

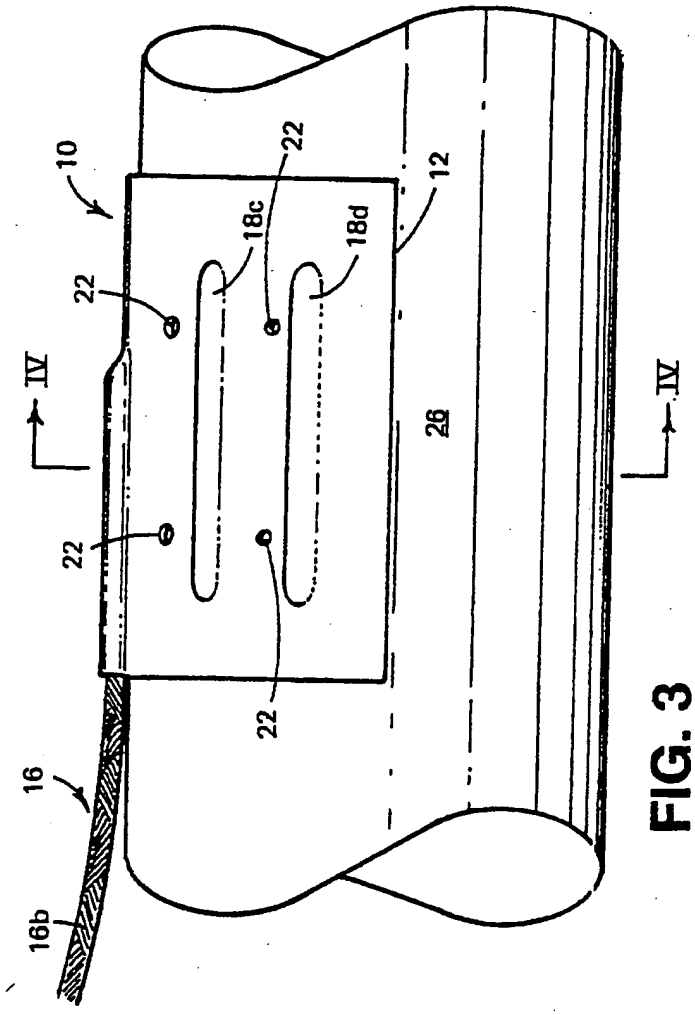

FIG. 3

The present invention relates to a bonding device for connections to lead sheathed cables.

Situations often arise when it is required to connect conductive earthing bonds to the exterior lead sheathing of electric cable of the type which is normally buried underground. Lead sheathing continues to be a favoured material for such sheathing because of its inherent chemical and mechanical stability when buried in the ground. The earthing bonds usually comprise one or more strips of copper braiding or conductor and the traditional method for attaching these to the cable sheathing involves fairly skilful and very time-consuming plumbing techniques. Layers of solder are built up on the sheathing with the ends of the bonding conductor strip(s) enveloped therewithin.

The traditional technique has the associated problems of (a) being time-consuming to achieve, (b) having a substantial skill requirement on the part of the fitter, (c) requiring substantial quantities of materials, such as plumbing metal, (d) inevitably requires substantial heating of the cable sheathing which can risk damage to the cable insulation and (e) potential unreliability of the joint depending on the particular plumbing skills of the fitter.

It is an object of the present invention to provide an alternative means of connecting earthing bonds to lead sheathed cables which avoids or at least substantially reduces the aforelisted problems associated with the traditional technique.

According to the present invention, there is provided a bonding device for connecting earthing bonds to lead sheathed cables, comprising a metal plate adapted to be fitted to at least one earth bonding lead, the metal plate carrying on its one side surface a charge of solder disposed within a channel or recess defined by the metal plate.

In one advantageous embodiment, the charge of solder is contained within a length of metal braid disposed within said channel defined by the metal plate. Conveniently, the channel is defined by turning under the longitudinal side edges of the metal plate whereby to embrace the longitudinal side edges of the braid.

Preferably, at least a portion of the metal plate and the braid is of curved transverse section for fitting around a lead sheathed cable to which a connection is to be made. A second portion of the metal plate and the braid is preferably straight and extends at an angle to the longitudinal axis of the first mentioned portion of curved transverse section.

In use, the portion of curved transverse section is laid over a lead sheathed cable so that the solder-containing braid lies in contact with the periphery of the cable. Heat is then applied to the metal plate, for example by a blow lamp or blow torch, whereby to liquify the solder and enable part of it to flow out of the braid onto the cable whereby to form a joint with the material of the cable when subsequently allowed to cool.

In another embodiment, the metal plate has a plurality of grooves or recesses in said one side surface which each carry a charge of solder.

In use, the metal plate is laid over a lead sheathed cable so that said one side surface faces the outer periphery of the cable. Heat is then applied to the other side surface of the plate so that the solder in the recess/groove(s) flows between the plate and the cable periphery and forms a joint therebetween when subsequently allowed to cool.

Advantageously, one end of the earth bonding lead, preferably a strip of copper braiding, is mounted within a further recess in said one side surface of the metal plate. The latter recess preferably terminates at one edge of the metal plate.

Advantageously, the width of the metal plate is such that when it is laid around a typical cable, it extends part way around the cable.

In all cases, the metal plate is preferably of copper and the braid is preferably copper braid.

References herein to "solder" would normally imply also the presence of conventional fluxes.

The invention is described further hereinafter, by way of example, with reference to the accompanying drawings, in which:

Fig.1 is a transverse cross-section (on the line I-I in Fig.2) through one embodiment of a bonding device in accordance with the present invention;

Fig.2 is a perspective view of the bonding device of Fig.1 prior to bending about the cable;

Fig.3 is a side elevation showing the bonding device applied to a cable;

Fig.4 is a cross-section on the line IV-IV in Fig.3, prior to heating of the plate to cause the solder to flow out of the grooves;

Fig.5 is a diagrammatic side view of a second, preferred embodiment of a bonding device in accordance with the present invention;

Fig.6 is a plan view of the bonding device of Fig. 5,

Fig.7 is a section on the line B-B in Fig. 5; and

Fig.8 is a section on the line A-A in Fig.5.

With reference first to Figs. 1 to 4 of the drawings, a bonding device 10 comprises a copper plate 12 of generally rectangular peripheral configuration. The plate 12 is of relatively thin grade copper that can be readily bent around the cable but has sufficient rigidity and strength to provide a strong coupling when fitted as described hereinafter. The actual thickness and area of the plate will depend to a large extent on the current carrying requirements. The plate 12 is formed, for example by stamping, with a central, blind recess 14 of sufficient depth and width to receive an end portion 16a of a copper braiding strip 16 which is to form the earth bond. The plate 12 is also formed with a plurality (four in this embodiment) of narrow, elongate recesses or grooves 18a,18b,18c,18d, which preferably extend in directions parallel to the recess 16. The

plate 12 is also formed with a peripheral lip or flange 20 and, in some cases, a plurality of through-holes 22.

The recesses 18 are each provided with a mass of suitable solder and flux (normally a Pb/Sn solder) as indicated at 24 in Fig.1. The copper braiding strip 16 is fixed to the recess 14 by any suitable means, e.g. welding, brazing, or any type of convenient mechanical fixture, so that its main portion 16b extends therefrom. The strip 16 may be pre-fixed to the recess 14 or may be supplied loose and fixed on site.

In use, the plate 10 is simply laid along the lead sheath of the cable 26, bent around the cable so as to assume the same curvature and secured such that the lip 20 bites into the lead sheath to form an edge seal. Alternatively, it may be preformed to suit the cable curvature. The orientation of the plate 10 is such that the recess 14, and hence the copper braiding strip, lies generally parallel to the longitudinal axis of the cable. The outside surface of the plate 10 is then heated, for example by a gas torch, so as to melt the solder in the recesses 18. The molten solder flows between the underside of the plate 10 and the lead sheathing so as to form a joint therebetween when allowed to cool. The peripheral lip 20 bites into the lead sheathing and prevents the solder from passing beyond the edges of the plate 10. The holes 22 allow air to escape and thereby facilitate flow of the solder beneath the plate. The holes may also be used for feeding in an additional charge of solder (for example when only a poor fit to the cable can be achieved) and as witness holes to determine when the internal solder has run. Preferably, the surface of the lead sheathing is cleaned beforehand such as to improve its solderability.

The recesses 18 need not run in the direction illustrated, but could lie in any convenient direction, not necessarily parallel to one another. In principle, the plate need not be of copper, although copper would be preferred in practice. The overall shape need not be rectangular but could be any convenient shape. More than one braiding strip 16 could be attached to one plate 10, either in the same recess 14 or in a plurality of such recesses (not shown). The means of providing the electrical connection to the plate need not be braiding but could include other mechanical coupling means such as an upstanding lug or stud fixed to the plate. The peripheral lip 20 can extend just along the longitudinal side edges or can also extend all around the plate 10 (except for the region 14 where the braid emerges).

The second, more preferred embodiment of Figs. 5 to 8 comprises an elongate rectangular metal plate 40 made of tinned copper strip (for example 0.3mm thick). Disposed on one side of the plate 40 is a length of tinned copper braid 42 (e.g. 50mm²) which is held to the metal plate 40 by turning under and inwards the longitudinal side edges 40c of the plate 40 so that they embrace the longitudinal side edges of the braid 42 (see Fig.8). A part 40a of the plate and the braid (preferably a major part) is caused to have a curved, preferably arcuate transverse section, as shown in Fig.7. The remaining (preferably minor) part 40b of the plate and braid is straight and extends at an angle to the first part, as shown in Fig.5, whereby, when the curved first part 40a is laid over a lead sheathed cable, the straight second part 40b extends away from the cable at an oblique angle.

The braid is arranged to hold a charge of solder on its surfaces and within its interstices. The solder can either be applied to the braid prior to the braid being mounted to the plate 40, or the solder can be applied to the braid after the braid has been mounted to the plate 40.

The straight part 40b of the plate and braid contains a first aperture 44 to enable this part to be connected to a further length of conductive braid, strip wire or the like, for example by bolting, rivetting or the like.

The curved part 40a of the plate 40 contains a second aperture 46 to serve as a witness hole and to enable further solder to be fed in to the braid 42.

The curvature of the curved part 40a (Fig.8) is preferably chosen to be of slightly smaller radius than that of a cable to which connection is to be made so that when the curved part 40a is laid onto the cable, it engages primarily at its longitudinal side edges. When the device is then urged against the cable, these edges dig into the lead and form side seals to prevent the egress of solder in these regions.

A bonding device as described above has the following advantages over the current plumbing techniques:-

a) Reduced installation time, saving perhaps fifteen minutes per connection in a typical case.

(b) Improved reliability of the connection.

(c) Traditional plumbing skills are not required so that it can be installed by an unskilled fitter.

(d) The amount of plumbing materials used can be reduced.

(e) There can be a reduced heat input to the cable, thereby reducing the risk of damage to the cable insulation.

Claims

1. A bonding device for connecting earthing bonds to lead sheathed cables, characterised by a metal plate (40) adapted to be fitted to at least one earth bonding lead, the metal plate (40) carrying on its one side surface a charge of solder disposed within a channel or recess defined by the metal plate.

2. A bonding device as claimed in claim 1 wherein the charge of solder is contained within a length

of metal braid (42) disposed within said channel defined by the metal plate.

3. A bonding device as claimed in claim 2, wherein the channel is defined by turning under the longitudinal side edges (42c) of the metal plate whereby to embrace the longitudinal side edges of the braid.

4. A bonding device as claimed in claim 2 or 3, wherein at least a portion (40a) of the metal plate and the braid is of curved transverse section for fitting around a lead sheathed cable to which a connection is to be made.

5. A bonding device as claimed in claim 4, wherein a second portion (40b) of the metal plate and the braid is straight and extends at an angle to the longitudinal axis of the first mentioned portion (40a) of curved transverse section.

6. A bonding device as claimed in claim 5, wherein said second portion (40b) of the metal plate and the braiding contains an aperture (44) for enabling this portion to be connected rigidly to an earthing bond.

7. A bonding device as claimed in claim 5 or 6, wherein the first mentioned portion (40a) of the metal plate and the braid contains an aperture (46) for use as a witness hole and for enabling feeding in of additional solder.

8. A bonding device as claimed in claim 1, wherein the metal plate (10) has a plurality of grooves (18) or recesses in said one side surface which each carry charges of solder (24).

9. A bonding device as claimed in claim 8, wherein one end of an earth bonding lead (16) is mounted within a further recess (14) in said one side surface of the metal plate.

10. A bonding device as claimed in claim 8 or 9, in which the metal plate has a peripheral lip or flange (20) adapted to bite into the lead sheathed cable for forming an edge seal around at least part of the plate.

11. A bonding device as claimed in any of claims 8 to 10 in which the metal plate is preformed into a part cylindrical shape.

12. A bonding device as claimed in any of claims 8 to 10 in which the metal plate is generally flat for bending around a lead sheathed cable in use.

13. A bonding device as claimed in any of claims 8 to 12 having a plurality of witness holes (22) therein.

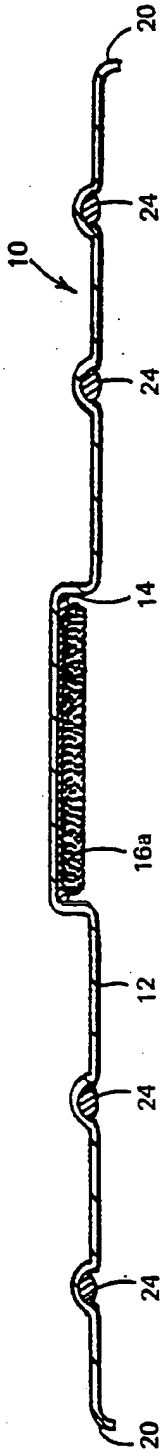

FIG. 1

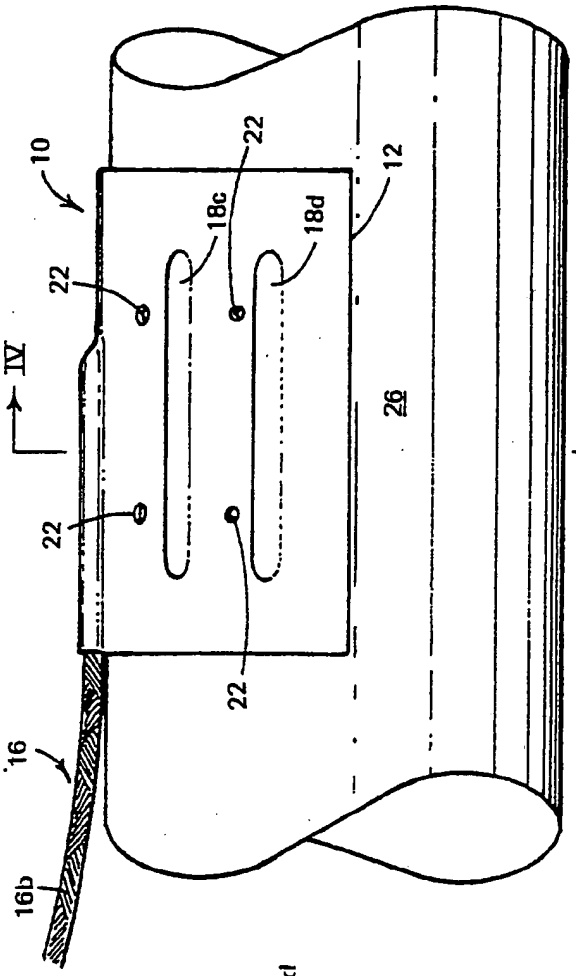

FIG. 3

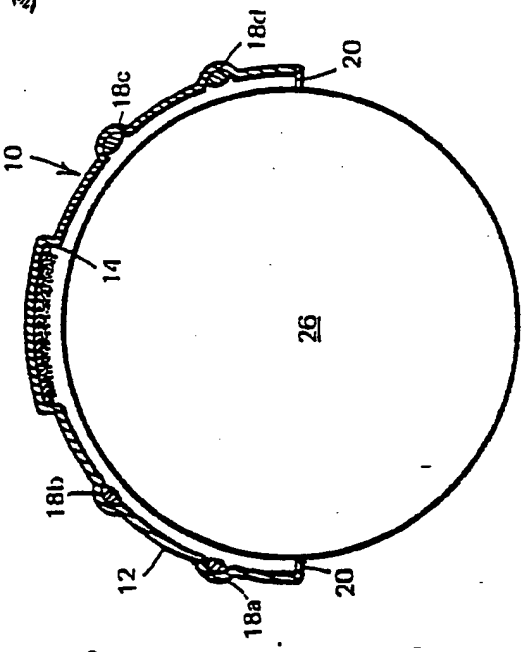

FIG. 4

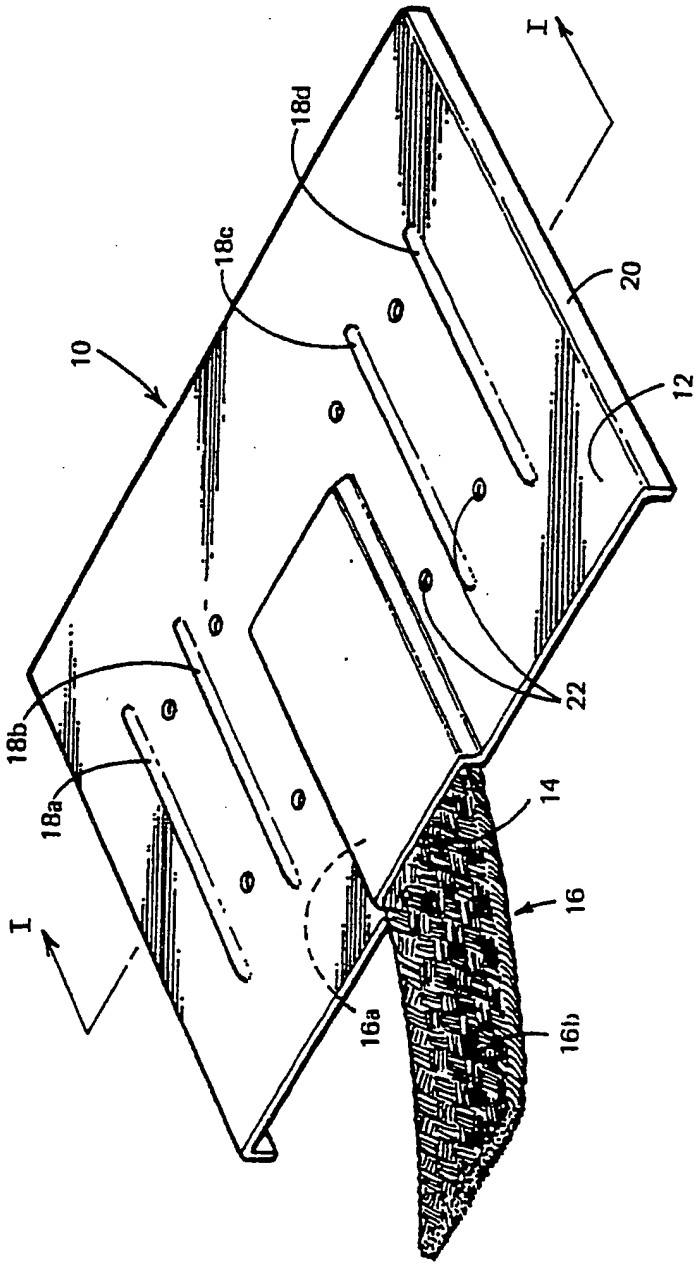

FIG. 2

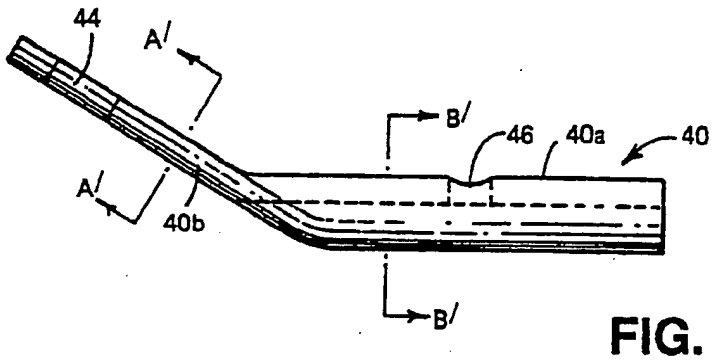

FIG. 5

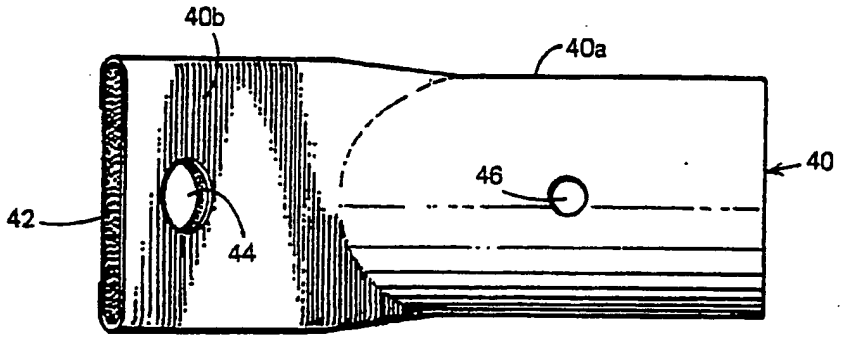

FIG. 6

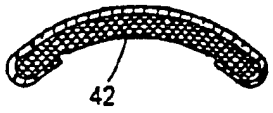

FIG. 7

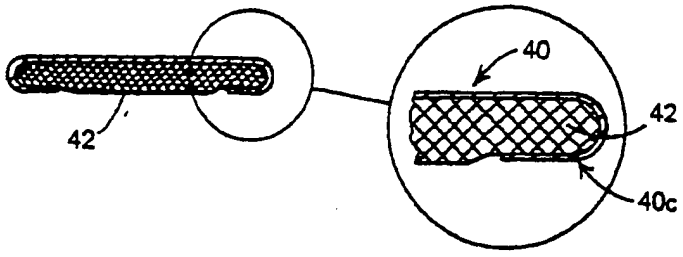

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 2630

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB-A-1151586 (J.K.MAYNARD) * page 1, lines 9 - 14 * * page 1, lines 29 - 46; figure 5 *	1	H01R4/64
A	US-A-3787797 (KURZ) * column 2, lines 24 - 31; figure 1 *	1, 4, 5, 11	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H01R
H02G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 JUNE 1991	KOHLER J.W.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)